

# Distribution Reliability Improvement Program

Exelon Utilities Program  
AM-EU-P192  
Rev. 2

**Effective:** 4/7/2020  
**Supersedes:** None  
**Review Type:** 3 Year  
**Core Function:** System  
Performance

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## 1. Purpose

- 1.1. This document describes reliability programs that are designed to improve the distribution system's reliability performance by preventing outages and reducing the number of customers impacted by an outage. This document provides a high level overview of these programs with emphasis on reducing distribution SAIFI (System Average Interruption Frequency Index) and CEMI (Customers Experiencing Multiple Interruptions). Additionally the programs may deliver benefits in CAIDI (Customer Average Interruption Duration Index) and CEDI (Customers Experiencing Long Duration Interruptions).
- 1.2. The reliability programs consist of programs that target poor performing or degrading performance areas.
  - **System Performance (SP)** – System Performance programs improve performance through modifications to system design and application of new technology and equipment to prevent outages and reduce the number of customers impacted by an outage.

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- **Pocket Reliability (PR)** - Pocket Reliability programs target sections of circuits that serve small groups of customers. The primary focus is on increasing customer satisfaction and addressing areas not specifically targeted by broader system performance programs. Customers experiencing a high number of outages from common causes are prioritized and addressed through the customer satisfaction programs.

## 2. Precautions and limitations

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### 2.1. Precautions

#### 2.1.1 None

### 2.2. Limitations

#### 2.2.1 None

## 3. Prerequisites

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### 3.1. None

## 4. Program

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### 4.1. ASSESSMENT OF RELIABILITY BY CAUSE

#### 4.1.1 Improving and managing distribution reliability is a key priority.

#### 4.1.2 The distribution system's reliability performance is challenged by:

- Material Condition
- Adverse weather conditions
- Increasing consumer requirements for improved reliability
- Regulatory perspective
- Political perspective / Township / Municipality / City Ward
- Performance metrics

#### 4.1.3 A comprehensive reliability analysis that categorizes the outages relative to historical performance by outage cause driver shall be performed to identify the leading outage causes that impact the distribution system.

### 4.2. IDENTIFICATION OF PROGRAMS THAT ADDRESS THE RELIABILITY DRIVERS

#### 4.2.1 Utilizing the reliability by cause data, identify asset categories and solutions that can target the cause drivers and deliver improvements.

##### 4.2.1.1 Examples of Asset categories (not a comprehensive list)

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- 4.2.1.1.1 Overhead mainline circuit sections
      - 4.2.1.1.2 Underground mainline circuit sections
      - 4.2.1.1.3 Overhead fused circuit sections
      - 4.2.1.1.4 Underground fused circuit sections
    - 4.2.1.2 Examples of solutions (not a comprehensive list)
      - 4.2.1.2.1 Lightning improvements
      - 4.2.1.2.2 Vegetation mitigation
      - 4.2.1.2.3 Wildlife mitigation
      - 4.2.1.2.4 Cable Replacement
      - 4.2.1.2.5 Distribution Automation (DA)
- 4.3. ASSESS THE BENEFITS AND COSTS OF PROGRAMS
  - 4.3.1 The costs of the program are weighed against its ability to improve reliability as measured by:
    - 4.3.1.1 Avoided customer interruptions (ACI) in support of SAIFI
    - 4.3.1.2 Avoided customer interruption minutes (ACIM) in support of CAIDI and SAIDI
    - 4.3.1.3 Reduction in outage frequency in support of CEMI
    - 4.3.1.4 Reduction in the occurrence of long outage durations in support of CEDI
    - 4.3.1.5 Ability to support composite reliability goals, regulatory mandates, or the alleviation of customer concerns
- 4.4. CALCULATE THE COST PER AVOIDED CUSTOMER INTERRUPTION BY PROGRAM
  - 4.4.1 The Cost per Avoided Customer Interruptions (\$/ACI) is calculated for each program impacting SAIFI. A lower \$/ACI results in a bigger reduction in SAIFI per dollar invested.
    - 4.4.1.1.1 The \$/ACI should be based on the ten year expected avoided customer interruption. Ten years of ACI factors in diminishing returns over several years.
    - 4.4.1.1.2 The avoided restoration cost shall be an estimate of future restoration costs that would be prevented by the program .
    - 4.4.1.1.3 Programs are compared based on \$/ACI and other factors, and the appropriate mix of programs is selected.
    - 4.4.1.1.4 A similar analysis utilizing ACIM may be utilized to include CAIDI and SAIDI benefits.
- 4.5. DEVELOP PROPOSED LONG RANGE PLAN (“LRP”) AND GOAL SETTING

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- 4.5.1** Utilize the assessment of the reliability drivers by cause, identification of programs that address the reliability drivers, and benefit vs. cost analysis to develop a proposed LRP and establish annual reliability goals.
- 4.6. DEFINE PROGRAM SPECIFICS**
  - 4.6.1 Benefits**
    - 4.6.1.1** Define what aspects of the reliability performance are going to be positively impacted by the work.
  - 4.6.2 Selection criteria**
    - 4.6.2.1** Define what the program targets and what aspects are considered in determining the work scope for the year.
- 4.7. MEASURE PROGRAM COMPLETION**
  - 4.7.1** Develop tracking methods to monitor the progress of the program on a monthly basis, such as a work down chart.
- 4.8. MEASURE PROGRAM EFFECTIVENESS**
  - 4.8.1** Confirm \$/ACI
  - 4.8.2** System SAIFI improvement
  - 4.8.3** System CAIDI improvement
  - 4.8.4** CEMI improvement
  - 4.8.5** CEDI improvement
  - 4.8.6** Green Board improvement
  - 4.8.7** Regulatory requirements satisfied
- 4.9. Assumptions**
  - 4.9.1** None

## **5. Roles and Responsibilities**

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- 5.1. RELIABILITY PROGRAMS**
  - 5.1.1** Individuals responsible for defining yearly programs scope and responsible for the implementation and execution of the various programs. Identifies reliability concerns and works with other internal organizations to improve results.
  - 5.1.2** Establishes cross-functional expectations with Engineering, Work Management, C&M, Project Management, T&S, Distribution System Operations, and Vegetation management on program execution through program management of the reliability programs
  - 5.1.3** Defines metrics and communicates progress to senior management.

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- 5.1.4** Responsible to Identify and recommend appropriate funding to support the scope of the defined programs.

## **6. Documentation**

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- 6.1.** An annual five year reliability plan that shows historical performance and future plans by program.

## **7. Terms and Definitions**

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**7.1. Customer Interruption**

- 7.1.1** A customer interruption is the interruption of service to one customer.

**7.2. System Average Interruption Duration Index (SAIDI)**

- 7.2.1** SAIDI is the total interruption duration for the average customer during a given time period. It is calculated by dividing the total number of sustained customer interruption minutes in the time period, normally a year, by the total number of customers.

**7.3. System Average Interruption Frequency Index (SAIFI)**

- 7.3.1** SAIFI is the interruption frequency the average customer experiences in a year. It is calculated by dividing the total number of sustained customer interruptions in the time period, normally a year, by the total number of customers.

**7.4. Customer Average Interruption Duration Index (CAIDI)**

- 7.4.1** CAIDI is defined as the average time required to restore the service. The sum of sustained customer interruption minutes (customers affected times the outage duration) divided by the sum of the sustained customer interruptions.

**7.5. CEMI (Customers Experiencing Multiple Interruptions)**

- 7.5.1** Number of Customers that experience “n” or more sustained interruptions divided by the number of customers served.

**7.6. CEDI (Customers Experiencing Long Duration Interruptions)**

- 7.6.1** Number of customer interruptions lasting “n” or more hours divided by the total number of customer interruptions.

**7.7. Distribution Circuit/Feeder**

- 7.7.1** A circuit owned and/or operated by an Exelon Utility and designed to operate at a nominal voltage of 34,000 volts or less and supplies one or more distribution transformers.

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### 8. References

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8.1. N/A

### 9. Attachments

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9.1. None

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## 10. Development history

| Revision 0       |   | Date: 4/10/2015 |
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| Reason written   | Establish an EU document for Distribution Reliability Improvement Programs to facilitate commonality across the EU companies.   |                 |

| Revision 1       |  | Date: 3/31/2017 |
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| Reason written   | Periodic document revision   |                 |

| Revision 2  |  | Date: 4/7/2020 |
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| UFAM Approver(s)  | Cory Summerson, Dir Engineering – BGE<br>Richard Cornforth, Dir Engineering - PECO<br>William Ruggeri, Dir Engineering – PHI<br>Ortega, Jaime, Dir Grid Analytics – ComEd |                       |
| Reason written    | Periodic document revision  |                       |